

MECHANICAL PROPERTIES OF SNAKE GRASS WITH SISAL FIBER REINFORCED PLA COMPOSITES

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ABSTRACT

The research The recent years, a technique of compressible and plastic injection molding functional process was simulated in sequencing in order to develop the best mixer method for fiber reinforced polymer composite like SGF, SG, and the matrix of packaging plastic material. The specimen [Composites and polymer plates] while cut and submitted to ASTM standard tests in order to examine mechanical characterization of tensile and flexural properties. The considering the materials matrix composites SF+SGF considering weight 10 to 30%. The special tested method for composites in the super reinforced model making process in injection molding under process. The FRP composites were considered homogenous load analysis of the distribution of fibers with polypropylene. The characterization of mechanical properties while monitors that the fiber material matrix composites did not have a good specimen of this fiber and matrix finally morphological analysis in the microstructure inspected analysis of the composites can be easily monitored by SEM techniques. The special model of results was an analysis numerically compared with high impeccable and stability

KEYWORDS: Mechanical Characterization, Behavior, Reinforced, SF, SG & PLA Composites

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INTRODUCTION

The most of scientific and engineers in lots of years gained knowledge in natural fiber -reinforced polymer composites were considered 3 factors only.

- Easily accessible
- Economical
- Eco-friendly

The main advantages of natural fiber composite built in specific stability. Low-cost, Considerable weight, ecosystem, biodegradable, From past literature survey has shown and reviewed in different fibers such as banana [1], oil palm [2], jute [4] as reinforcement in polymer material composites.

Natural fibers as functionally attain more importance due to the special part during to the special part during fabricated processing, Their economically with strongly [3]. The mechanical behaviour and characterization

and probably oriented fiber composites are stability and strength recommended by optimum fiber length, fiber weights [4]. The reviews the mechanical properties of the unprotected orientation value analysis short polymer fiber. Reinforced composites and investigated the length of response 53% to 60% with ratios respectively. The extensively analyzed in different structured applications [5]. Due to installing load-bearing capacities' most literature was examining equal systematic fiber composites. [7] This research paper presents were extraction and presentation of research methodology in is phallic plaster composites to metal materials with snake grass fiber in equal analysis, polynomial weight ratios to analyze for the minimum to maximum of mechanical properties[6]. The polymer-based and introduced and combined natural fiber composites. Widely used in the hybrid processing of composites In applicable were differently oriented in polymer composites, or matrices have several usages or purpose of home appliances or lightweight equipment an economical and eco-friendly The snake Grass fiber [SG] were extracted is need able to minimal water curing process and mechanical behavior of tensile properties. Of these natures, the fiber was measured according to ASTM standards.[9] The SGF fiber was used to prepare the probably considered and super fiber reinforced instance of polymer in different optimum composites. Then fiber was the hand lay-up technique of methods follows by most using compression, injection die-molding process activity. The special mechanical properties were studied for various fiber weight ratios with respect to different lay-up lengths.[10]The up normal behavior's properties attend at 25% of fiber fraction values was considered in past surveys.

The random sisal fiber was reinforced polyester composites for longitudinal and pronominally tensile load ranging from 0 to 30%. The preparation of research methodology was initialized for the coir fiber with composites of hybrid polyester were good mechanical properties found for process and making optimum parameters should deliver this different fiber composite[11]. The SG Fiber with polymer composites where oxygen plasma to prepare the polyester composites in different optimum values using the hand lay-up methods of parameter behaviour analysis focused constant values fraction of better fiber process[12]. Presently advanced composites introduced it. One literature of previous randomly oriented in mixed and short sisal /banana fiber composites of hand lay-up techniques utilized in a constant value fraction of 1: 1, 3: 1, 1:3 ratio. Relatively weight possible metal composites attend in different conditions [13]. The palm /Coir fiber, mixed with the sodium lauryl surface treatment, apply the mechanical properties in properly matrix follow behavior analysis numerically and chemical process [14-15]. Concepts of lamination techniques like bi-layer and poly-layer, tri-Layer methods of techniques were introduced in short bagasse /coir fiber with mixed epoxy novel composites [16]. A swelling thickness of water absorption is different levels of study polynomial OD studied polynomial fiber composites like oil palm with instance epoxy composites. The optimum of volume fraction techniques utilized in 3:1 was used to prepare for the different ratio of water absorption of EFB-jute/Jute respectively [17-18]. The patterns of specimen roselle /sisal fiber same optimum length Vs Wight ratio between constants to study the mechanical properties. A single or dual fiber composites analyzed and computed in many scientific papers attempts on natural combine synthetic fiber reinforced and improve some mechanical properties[19]. The fiber reinforced polymer and polypropylene, Palestine was most applicable in car bumper, vibration and observation systems analysis in different epoxy composites.

[20-21]The research was studied and investigated in structured and thermal behavior properties analysis of jute /banana fiber reinforced in optimum epoxy composites. While investigated in 100 /0 to 0/100 ratio of weight by manually techniques analysis in different methodologies. And most of the scientific papers, factors of review concern only fiber or non-fibers interfacing by different chemical parameters should keep the orientation of load transfer into a possible non-environmental damage of fiber scheme.

EXPERIMENTAL DETAILS

Natural fibers is most biodegradable product making attend the form of uninterrupted specimens available in a different class. The classification of fibers in refers to a figure 1.

Natural Fiber



Figure 1: Natural Fiber in [a] Snake grass Fiber [b] Sisal Fiber [C] poly Lactic Acid

Above the fibre classes used worldwide. This most of the fibers are degradable and available in the market and economic systems follows green composites. Most of the literature study in nature fiber composites process maximum /moderate stability and water absorbed, reliable process obtained. But the main literature problems focus on using literature problems focus on using pure biodegradable with closed-loop process. [22-23] Instances of polymers have been high transmission temperature into low strength process [25] table 1 shows the physical properties of SG/SF content.

Physical Properties of SG/SF/PLA

Table 1: Physical Properties of SG/SF/PLA

Properties of Sisal Fiber and Snake Grass Fibers				
Fibers	Density	Tensile Strength	Tensile Modulus	Elongation
	(kg/m3)	(MPa)	(GPa)	%
Snake grass	887	287-545	9.7	2.87
Sisal Fiber	1.45-1.5	350-700	9--22	2-7-
Properties of POLY LACTIC ACID (PLA)				
	Physical	Nominal Value		Unit
	Specific Gravity			
	0°F	1.24		
	73°F	1.24 to 1.26		g/cm³
	Melt Mass-Flow Rate (MFR)			
	210°C/2.16 kg	6.0 to 78		g/10 min
	190°C/2.16 kg	1.5 to 36		g/10 min
	Molding Shrinkage Flow			
	0°F	3.7E-3 to 4.1E-3		in/in
	73°F	0.30 to 1.1		%

Snake Grass Fiber

The fiber is a uniquely identified fiber extracted from the south Indian side. This is very easy to water retting process. The past scientific paper presents like sisal and coir fiber is collected from the local resources. Were physical and chemical properties of presents fibers have presented the table 2. The main role of this fiber examination and elongation at break, Young's modulus, density is needed this research plays an important role in this mechanical property of the fiber and composites. This SG is lower than sisal and coir fiber. The fiber and matrix are also the composition of the legion content at a minimum level its accomplished were compared to other fibers then manual cutting and grown in the volume fraction

techniques utilizing in 0.3 to 1.2 meters were taken optimum lengths. Snake grass plants were cut from the plants was cut from the plant and hanging in stands manual cleaned the throughput by water. This process takes at external green works. Fibers to get soaked absorbed in biodegradable process engaged and removal filaments issues from further activities. This different samples to take in 10mm to 30mm and 60mm, 120mm lengths respectively.

Sisal Fiber

Sisal fiber is most domestic fiber in natural fiber and is very easily harvested in this agriculture field. It is cultivated in sisal plant. The plantation of works formally explained is agave sisal Ana. These specimens of plants produce reciters of sword – formed leaves which begin toothed, and gradually lose their with maturity. Each leaf contains a number of long straight fibers which can be detached in a process known as decortication. During the tough fibers behind. The fibers can be spun into thread for twine and textile production paper products. The flexibility of sisal fiber can be very invasive and clogs the nature's waterways and can be killed by a light frost.

Poly Lactic Acid (PLA)

This nature of works begins in this **PLA3051D** is pellet formed stage will the expansion of Poly [lactic acid] is a biodegradable and bioactive Thermopolis light melting point instance of the resources applications. A First case of manufactured starts at tapioca roots, chips or search (mostly in Asia) In 2010. PLA had the 2 ND highest consumption in this present worldwide available in this material. This Mechanical properties explanation was defined in table 2. The name of 'Polylactic acid' it does not comply with IUPAC stands as follows. Its potentially replace with polypropylene with induced in acid formation of rather than other poly groups' lactic acid is biodegradable and characteristics similar materials available in PP [polypropylene] and, Polyethylene [PE], Polystyrene [ps] in these available markets in the petrochemical industry. This is suitable for warp materials follows. Additionally, the ease with which polylactic acid melts allows for some interesting applications in 3 dimensional printed and etc.

Table 2: Mechanical Properties of PLA

Mechanical	Nominal Value	Unit
Tensile Strength		
Yield, 0°F	8840 to 9500	Psi
Yield, 73°F	2250 to 10400	Psi
Break, 0°F	7080 to 8150	Psi
Break, 73°F	2000 to 10200	Psi
73°F	6930 to 10000	Psi
Tensile Elongation		
Yield, 0°F	9.8 to 10	%
Yield, 73°F	1.0 to 8.5	%
Break, 0°F	0.50 to 9.2	%
Break, 73°F	1.0 to 12	%
Flexural Modulus		
0°F	347000 to 715000	Psi
73°F	44200 to 1.38E+6	Psi
Flexural Strength		
0°F	6950 to 16000	Psi
73°F	1310 to 16100	Psi

FABRICATION PROCEDURE FOR SPECIMEN

The fabrication of its present works expected in less time, more reliability of workpieces to take place. However, in this research works focused only this sequencing of works will follow. Because this extraction of fibers this process examines in only for simple retting process only. And then preheating of this works its presence of pre-drying and manufactured by using an injection molding process applied in standard dies and expecting of works shapes. After five steps will proceed this testing component. AS this sequencing of flow process as shown in figure 2.



Figure 2: Fiber Preparation Process

The first step it is above this figure to consist in this research works SG and SF leaves are collected from different location of plants. Whether this process collected leaves are cleaned in the water for removing impurities and sand. After washing of leaves, They are crushed slightly through the weight without damaging the fiber for easy removal fiber. The crumpled leaves soak in to near the 4 days. The extraction of this work fibers is taken out of water begins content present inside of the fiber is removed to keep in 8 hours. The above this fiber will depart dark room. The dried fibers are chopped in 3mm to prepare the entire composites. The chopped fibers can be weighted based on volume fraction [VF]. Volume fraction like 10% to 30 % increment of values defines in 5% to extraction our process. Second steps are plastic materials are formed in various shapes of pellets in raw material and manufactured in paper bags.

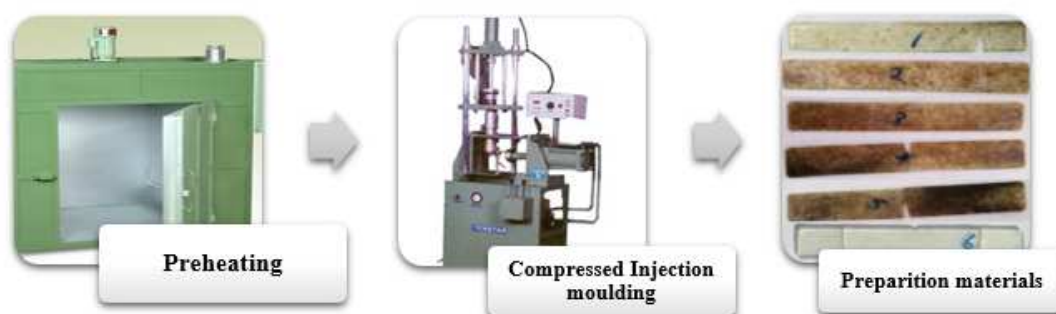


Figure 3: Fiber Reinforced Polymer Composite Preparation Process

This especially for non-moisture, and lightweight and hydrolysis for the different physical properties can decreases. At the same time, the fiber also contains were determined to not exist in fibers. In this research works view only for molding materials can be before they are put into the hopper dryer and its necessary of constant temperature to melting

this stages like 35°C. After this poly material will drain in the bottom of the nozzle port in some of the weight ratios. The is time pre-drying effects to maintain this possible temperature to follows as shown in the figure. The final injection molding process is manufactured process for producing parts from injection materials, mold to host of thermoplastic stages in to thermosetting process will define in these materials in these polymers as shown in figure 3. After this product will be designed to usually in highly compressed to the execution of this product in this vertical injection molding process. This preparation of this injected material was dying in shapes of the standard will follows flexibility in size and shape possible through the use of this process has continually extended in this boundaries designs and plastics are enabled in this replacement of traditional materials methods and techniques only made be done it. Final causes to define this volume fraction calculation was determined in this scenario.

TESTING OF COMPOSITES

Tensile Testing

The above fabricated in fiber reinforced polymer composite is cut and saw process to get **ASTM D3039** dimensions of schematic diagrams of a tensile specimen first prepared it. The tests of was carried its universal testing lab following techniques in this 40% relative humidity of factors will consider on this record as follows. The different types of specimens were performed in this, namely SG+SF+poly acid formed in this structured in this specimen as formed to keep standard size in 250 mm length and 25 mm width and 3mm thickness. The capacity of the equipment's as follows in KIC 2-1000C in maximum 100KN. The standardization based on these materials in determined in young's modules and poisons ratio and stability and strain rate and hardening obtain this result was identification values to define it.

Flexural Testing

The most of this flexural equipment's were performed only one same tensile ratio and machine for stands forms in **ASTM D790** in this criterion. While the similar process to be examine this schematic diagram follows in this tested specimen. This performed specimens can be various temperature classes by 40% this relatively and humidity of these specimens as two ends fixed and mid end only loaded at this certain point to concern this shoulder will be attached with 'U' shaped and 'V' shaped of this behavior analysis. The reaction of this specimen as supported and until it fractures and breaks deformation define two, stage one is U and V. This flexural peace's of the test determines in maximum stress induced in the entire model.

Impact Test

The impact of the testing machine with Charpy arrangement is plays to perform the tested. It is done as per the **ASTM: D256** stands follows it. This commercial engineering field follows in Izod test is most commonly used to evaluate in relatively and toughness material to impact loads in different quality of functions was controlled in different applications. This tested of these parts will be examined in the fast and economical test as examine it. This is very accurate and different actual operation conditions as Belgians. The employees of engineering field laboratory its stands of length specimens 65mm and 13mmwidth and 3mm thickness should be determined and easily to the observed results.

Water Absorption Tested Specimens

Water absorption tested equipment as evaluated in terms of weight and increase's the composite of specimens immersed in water at different actuation of this 48Hours. This temperature of as per freshly cut samples of dimensions stands firm in metric units and 20mm length 20width and thickness 3mm were measured this water absorption. The tested

specimens are shown in the figure.

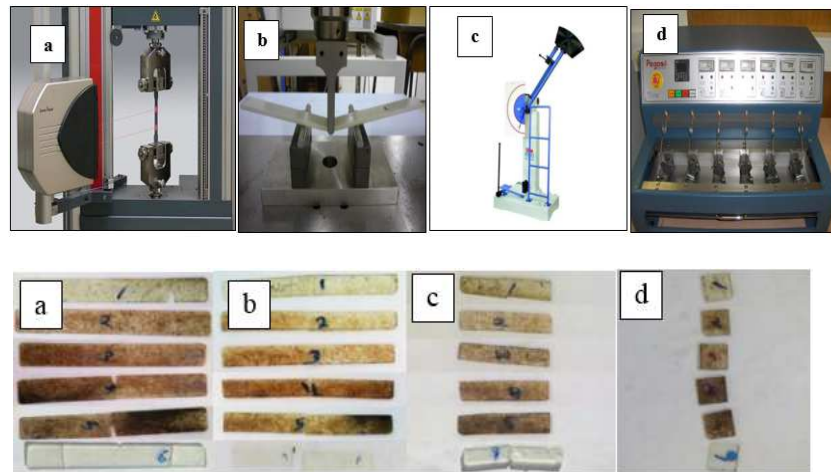


Figure 4: [a] Tensile Experimentation [ASTM D3039] [b] Flexural Tested Specimen [ASTM D790] [c] Impact Tested Specimen [ASTM: D256] [d] Water Absorption

RESULTS AND DISCUSSIONS

Tensile Properties

The two types of FRPC materials are a universal testing machine to find these different properties. A sample of the graph will show in this stress Vs strain is shown in SG-SF -Polyacid composites used in Compressed injection methods. The various mechanical characterization, properties to fabricated in this composite are concluded in better comparison. Its SG+SF poly acid composite was highly stretched and strength and the tensile composite of this material were corresponding different values. The stress induced In nearly high with the response of strain formation its linearly to consist in this equipment. This strain for all composites and reactive deformation as shown in the figure. But those expecting of this bride composites were determined in the summarized area. All the composites manufactured in highly responsively and more volume fraction will be compared with 1.18 times better than other alternative composites. SO this process of composites [23-24]its presented papers its SG +SF fiber its composite will compared with tensile performed on different types of composite's were examining it. This has also been analytically and proved by various mixtures in this hybrid injection molding process.

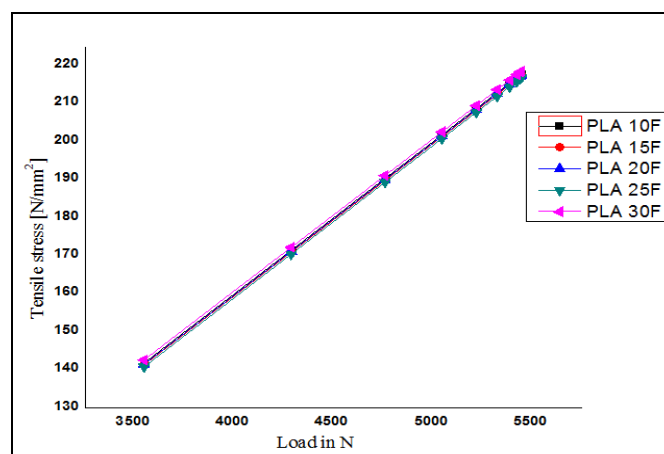


Figure 5: Tensile Compression Load Vs Different FRCP Composites

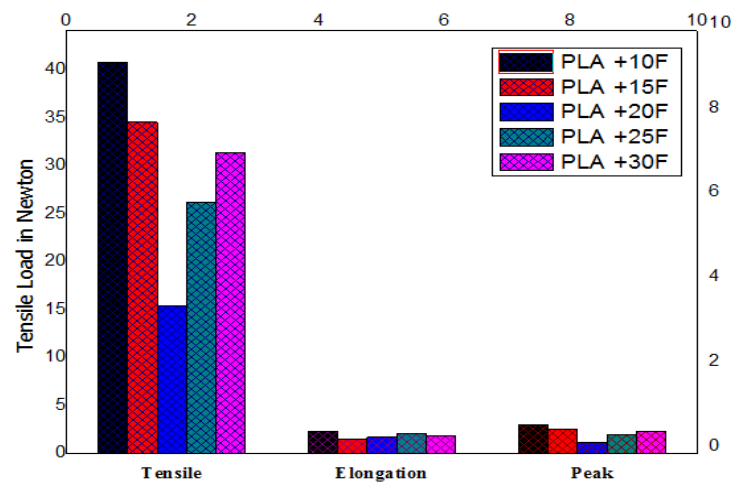


Figure 6: Comparison of Tensile Properties of PLA Composites at Various Fiber Weight Percent's

Flexural Properties

The sample of these graphs as shown in the figure flexural strength observed for SG-SF-poly acid composites of displacement's of this load determined in this load in around in 1000 N. After this break test in place of maximum displacements of this graph will attain different composites tested. The results were examined designated that the displacement of breaking exists. The results of SG-SF-Poly acid results better than others.

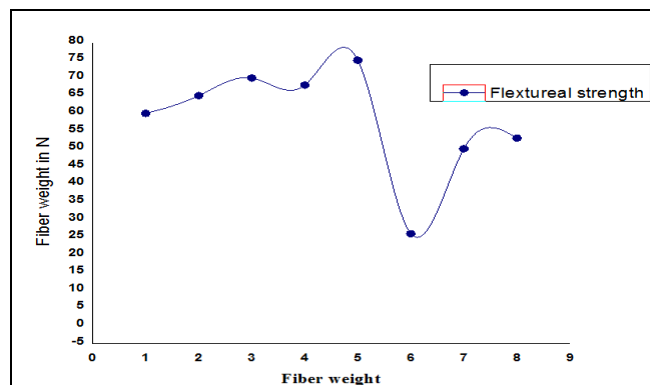


Figure 7: Variation of Flexural Strength with Various Fiber Weight Percent of PLA Composites

The stress – strain curve was observed in different materials where indicated in this stain increases of this stress will propagate up to 17n/mm2 specimen reduce of this breaking occur it. The breaking point was determined in averaged values and apply different composites are present in this paper. This paper declared SF-SG-poly acid is taking load will capable of flexural at any moment of this takes place.

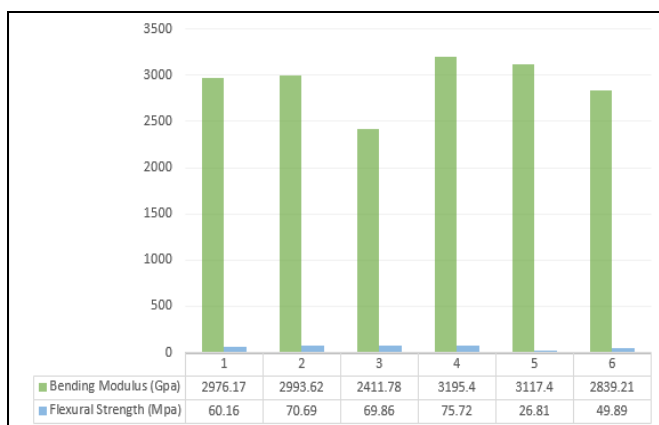


Figure 8: Comparison of Flexural Strength and Modulus of Various Fiber Weight Composites

Impact Properties

This analysis of past scientific papers will define incapability of the different specimens an impact test its carried out was rare then the other impactful test will carry out an investigation in Charpy tests. The energy loss is found out the reducing obtained from the Charpy impactites test. The impact process is involved in crack initiation and growth in the poly composite in the results of the Charpy test is presented in the figure. The hybrid results indicated that the maximum impact strength is obtained for SG+SF fiber composites performed in when compared with other FRPC will good agreement.

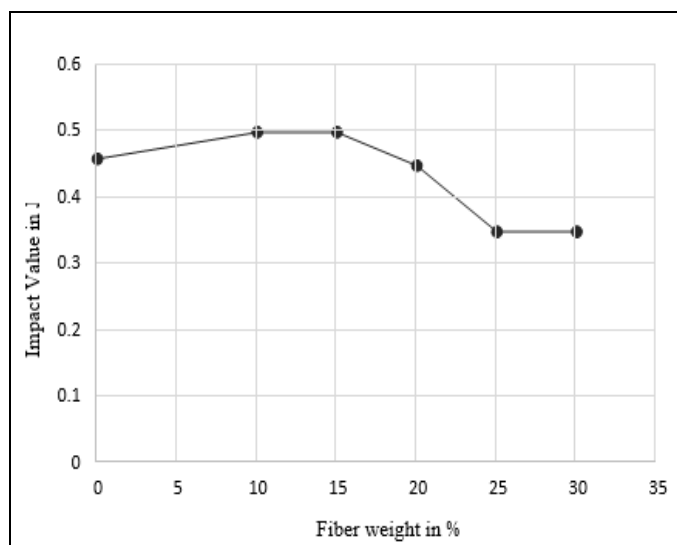


Figure 9: Shows the Variation of Impact Strength with Fiber Weight Percent for PLA Composites

Water Absorption

The water absorption behavior of all five specimens was determined in terms of weight increase for composite specimen immersed in water at 23°C as per ASTM D 570. The increase in weight percent was compared in the Figure.

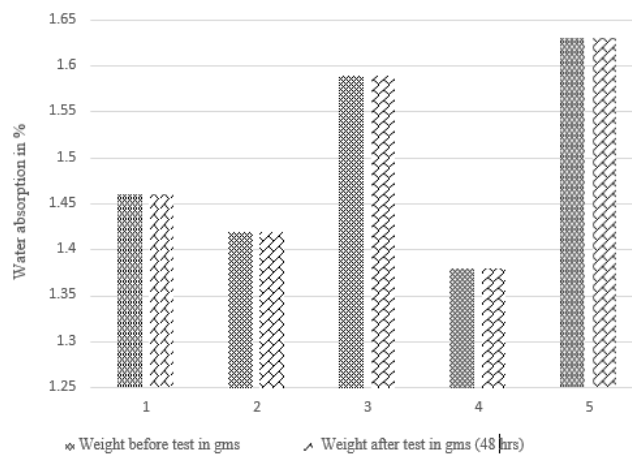


Figure 10: Comparison of Water Absorption Properties of Fiber Composites

Morphological Analysis

This is especially for surface characterization analysis is define as Morphological analysis or Scanning. Electron microscope images is taken to observe in interfacial properties. Wherever the crakes and internal structures of the fractured surfaces in this FRPC composite material. Most of the compressive injection materials were examined in the surface through roughness observed in this composite material in this presented in the figure. As shown in figure surface of behavior in externally and internally to different scales and depth of the impact of the specimens in desegregated in the behavior at the point. In this image, top portion images show the SG-SF-Poly composites were done. Top portion top surface vertical direction and middle of the surface shown in tensile tested part will find to be damaged in the crack detection in sprouted surfaces.

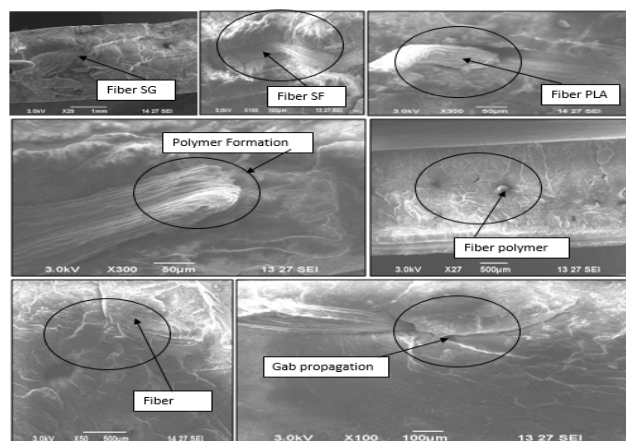


Figure 11: Morphological Analysis [SEM Microscope of a Flexural Frustrated Specimens]

This show the arrangements of FRPC is arrangements of this layer by layer to define in these cracks. This perpendicular to the other layer shows in the SEM Microscope of a flexural frustrated specimen. In this phase of delimitation is found in a cross-section of different loads will propagate this crack and rather than very little stress failure induced in this matrix of composites.

CONCLUSIONS

The best specimen manufactured process in the compressed injection molding in under vacuum which leads to materials with single and dual fiber composites distribution of fibers and free stability and suitability of this mechanical behaviour was tested and operated in This flexural test and tensile tested results as materials with high performance in this higher strengthen and harming obtain materials its highly reinforced in this molding process. PLA-SG/SF bio composites have potentially replaced in ecological effects will definitely in alternatively to natural reinforced materials in this capacitation. This is experimentally seen in testing results where to examine and interactive between the SG/SF and PLA Matrix polymer composites where specific module and experimental values of high strengthen and weight composites of commercially analysing it, however, impact properties is vainly imperative as well as biodegradability and compostability of the PLA -SG/SF biocomposites should also be investigated results finally impressed as given below:

- The tensile load gets the highest value obtained in the 15% of VF and then minimal up to 30% of VF. The pure PLA has lower values of break load. It showed the fibers maximums the strength of the composites. And this PLA 15% VF has a maximum tensile strength allocated in elongation value on compositions.
- The flexural characterization of PLA composites, it is observed that the flexural strength and the modules were around 80.50Mpa and 3462.37GPa respectively.
- 20% of this FRP composites weight reduced in this flexural observation of this 23°C its performed it.
- Depends on this PLA fiber ASTM D570 it's the increase's of weight percent were compared to determine will betterment results examined it.

NOMENCLATURE

Abbreviations

- SF – Sisal Fiber
- SG- Snake Grass
- PLA- Poly Lactic
- FRPC- Fiber reinforced polymer composite
- SEM - Microscope of a flexural frustrated specimens

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